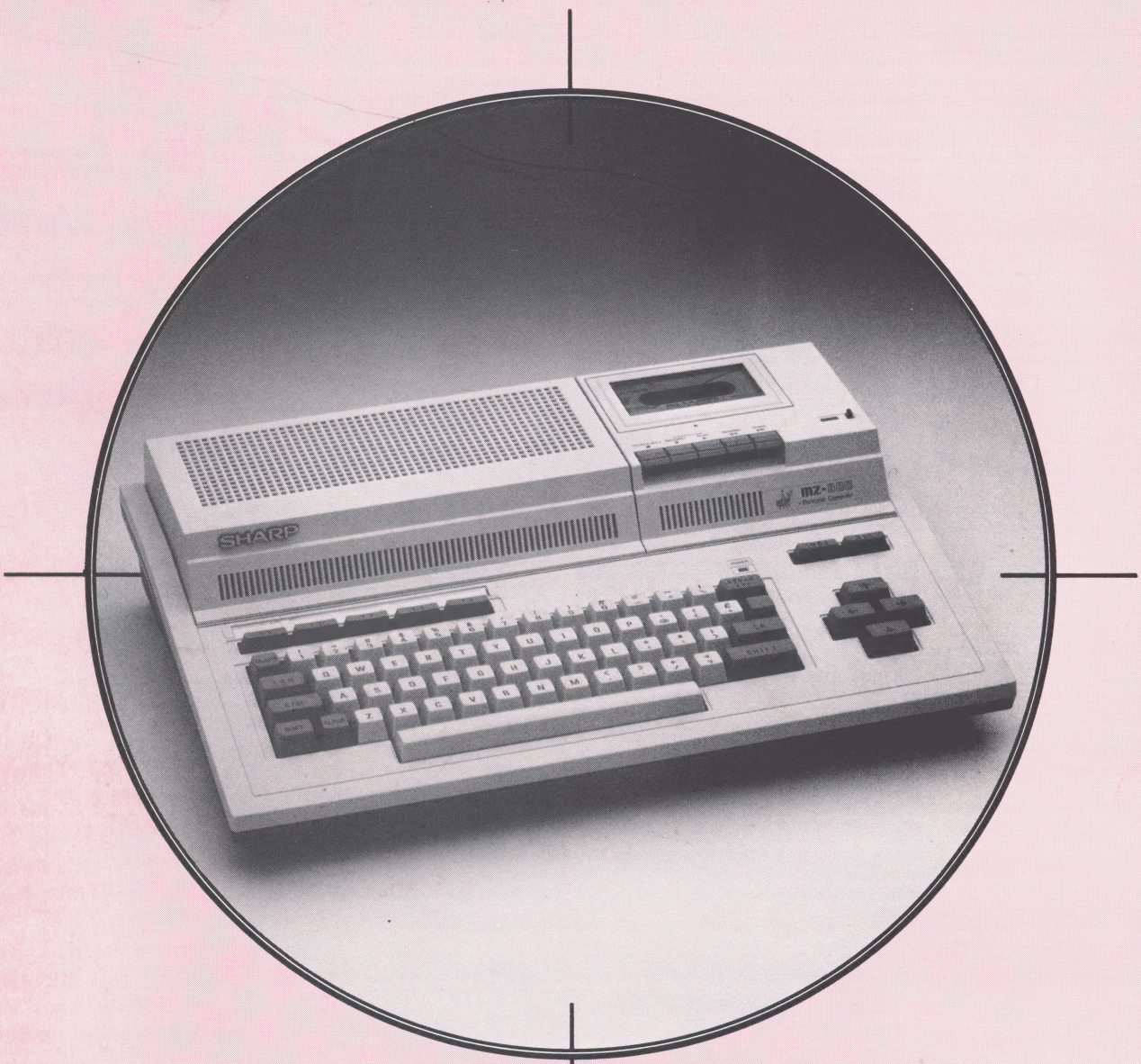
SHARP FOCUS

The Australian Magazine for SHARP Users

Issue No. 3 - September 1985 - $3.50



- MZ-700 SPACE BOMBER
- SOFTWARE LIST for the PC-5000
- FULL REVIEW OF THE NEW MZ-800
- SPREADSHEET PROGRAM for the PC-1500

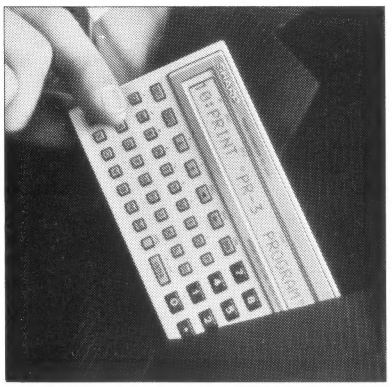
NEW

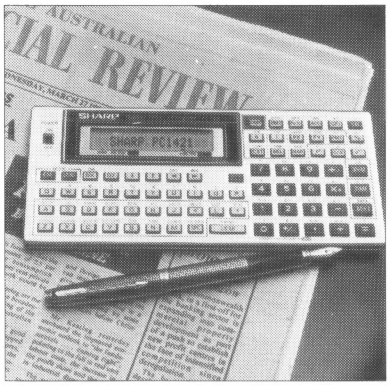
Registered by Australia Post - Publication No VBG7240

Help is at hand with a Sharp pocket computer.

PC1251
4.2K byte RAM.
24K byte ROM.
24 digit LCD.
Options – Cassette interface, Printer and Cassette interface, Printer and Microcassette, Software tapes. Also available a range of pre-programmed software tapes.

$180*.





PC1421
Financial computing
4.2K byte RAM.
40K byte ROM.16 digit LCD.
Operate as computer or financial calculator.
Built-in business/financial functions. Including compound interest, cash flow analysis, selling price and margin calculations.
Options – Cassette interface, Printer and Cassette interface.

$195*.

NEW!

PC1350
5K byte RAM expandable to 21K byte.
40K byte ROM.
24 digit by 4 line text or 150 by 32 dot graphic LCD.
Built-in RS232C interface.
Options – Cassette interface, Printer and Cassette interface, 8K or 16K byte RAM expansion card.

$265*.

NEW!

PC1500A
8.5K byte RAM expandable to 24.5K byte.
16K byte ROM.
26 digit text or 156 x 7 dot graphic LCD.
Options – 4 colour printer/plotter and cassette interface, RS232C and Centronics standard interface, 8K byte programmable RAM module, 8K or 16K byte programmable RAM module battery supported plus Technical reference manual.

$315*.

PC1401
Scientific computing
4.2K byte RAM.
40K byte ROM.
16 digit LCD.
Operate as computer or scientific calculator.
59 scientific functions.
Options – Cassette interface, Printer and Cassette interface.

$195*.

PC2500
5K byte RAM expandable to 21K byte. 72K byte ROM.
24 digit by 4 line text or 150 by 32 dot graphic LCD.
Built-in 4 colour printer/plotter, cassette interface, and RS232C interface.
Built-in business software.
Typewriter keyboard.
Options – 8K byte or 16K RAM expansion card.

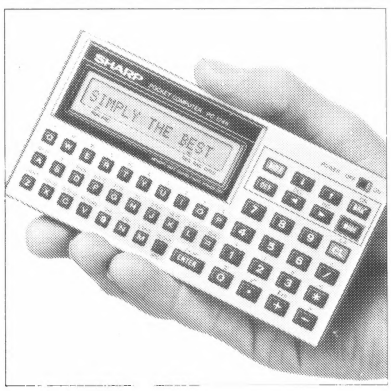
$545*.

NEW!

PC1246
2K byte RAM.
17K byte ROM.
16 digit LCD.
Options – Cassette interface, Printer and Cassette interface, Printer and Microcassette.

$85*.

NEW!



Sharp cassette recorder available as an option for all units
*Recommended retail price

Sharp pocket computers are small enough to take anywhere and big enough to perform sophisticated computing functions. Phone today for the location of your nearest Sharp pocket computer dealer.

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Simply the best in pocket computers.

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All enquiries and contacts concerning this Publication should be made to SHARP FOCUS, Shop 2, 33 The Centreway, Blackburn Road, Mt. Waverley, Victoria 3149, Australia. [Telephone: (03) 232 7055].

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Contributions are welcome from readers or other interested parties. In most circumstances the following payments will apply to published material: Letters-$5.00, Cartoons-$5.00 and a rate of $10.00 per page for programs, articles etc.

Contributions will not be returned unless specifically requested coupled with suitable stamped and addressed padded bag (for tapes or disks) or envelope.

had never
said!

Ed

MEMORANDUM

To: SHARP FOCUS READERS **Date:** September 1985

From: The Editor

Subject: EDITORIAL

We move into the third issue of SHARP FOCUS with news of the release of the MZ-800. It is certainly an improvement on the MZ-700, but I needn't add any further comments as you will find a comprehensive review in this issue. In addition, you will find the first part of a review on the PC-1350.

In fact, this month, there are articles/programs covering the PC-1350, the PC-1500, the PC-2500, the MZ-700, the MZ-800 and the PC-5000!

I am pleased to see that a number of User Groups have taken advantage of the free space we provide in the magazine to advertise their existence. It is a good opportunity to swell your numbers, but please remember, there is a deadline of the middle of each month in which to get your details to these offices to be reasonably certain of inclusion the following month.

I am still looking for 'heaps' of contributions from across the range of Sharp equipment, and I guess will never be satisfied until I have too much. They may take the form of programs, hints or tips for other users or even a copy of your group's newsletter, all of which will receive payment if published. It goes without saying that the content of this magazine is ultimately determined by the end-user (or should that be end-reader?).

Many would-be contributors are afraid that their piece of software is just not good enough or relevant for publication. To those people I would simply say - how often have you found a listed progam which, as a whole is of no real use to you, yet within the program is a routine or an approach to a problem you had never thought of and can be used your own programs? Enough said!

Ed

MEMORANDUM

To: SHARP FOCUS READERS **Date:** September 1985

Review of the MZ-800

by Kevin Poynton

This month will see the release of Sharp's long awaited MZ-800 computer. The MZ-800 with its many options is an attempt by Sharp to bridge the gap between home and business computers. Will they succeed where others have failed?

Apart from high-resolution colour graphics and three voice, six octave sound capability the MZ-800 consists of 64K RAM together with built-in cassette storage, dual Atari compatible joystick ports as well as facilities to interface a multitude of extras.

There are many ways to look at the MZ-800 and in all honesty it's hard to know where to start. Perhaps for those with prior experience of the MZ-700 a quick comparison could be an entree followed by a full menu of the delights of this new machine.

MZ-700 COMPARISON

The new MZ-800 is similar in many ways to the MZ-700. The design and keyboard are similar and it even has a built-in MZ-700 mode capable of running most MZ-700 software. Major differences are of course high resolution graphics, better sound and more comprehensive Basic.

Sharp have this time seen fit to incorporate a standard centronics printer interface. MZ-700 owners who wish to 'trade-up' need not despair. Sharp have also provided MZ-700 compatibility via the use of dip switches. Perhaps it's as well that we get the bad points over with at this stage and then look at the more positive aspects.

Firstly, when in MZ-700 mode (using the supplied MZ-700 compatible Basic) it is not possible to run those programs using joystick routines. Hardware for the joysticks on the MZ-800 is totally different to the MZ-700 and this will cause software houses to have to provide two versions of their joystick games.

Secondly, Basic has again to be loaded from tape (assuming you have no disc drive) and this takes an amazing 4.30 minutes for the full MZ-800 Basic and just over 3 minutes for the MZ-700 Basic. Admittedly, some people prefer this because it leaves a full 64k for machine-code programs and other languages but why, oh why, can't we have a Basic in ROM that we can switch out?

Well gripes over, it's on to the good news - and there's plenty of it!

GRAPHICS

The high-resolution graphics must be considered one of the best features of the MZ-800 and they are quite incredible.

In text mode the MZ-800 offers a choice of 40 x 25 or 80 x 25 formats. In graphic mode, high resolution graphics of 320 x 320 pixels are produced. The result on the screen is good as is the graphics interface provided by Basic.

Plotting of user defined graphics anywhere on the screen in any colour is achieved by using the command SYMBOL. It also provides 255 steps of magnification in both the horizontal and vertical directions. Coupled with this, you can plot shapes at 90, 180 and 270 degrees away from normal.

Software houses should have a ball with these features and there can be no excuses for not providing software of the highest quality.

Unfortunately the MZ-800 Basic does not support sprites but I've no doubt it won't be long before the 'hackers' learn how to generate them.

SOUND

Unfortunately I never paid much attention to my music teacher when I was at school (or any of the others for that matter!) and my knowledge of that subject and sound generation is extremely limited. I have, therefore, limited my comments to the bare specifications of the facilities provided.

Musical notes of varying duration can be played over six octaves using the MUSIC command. Three sound and one noise channel are provided through a programmable sound generator and internal speaker, the latter thankfully having a volume control!

There are three other commands associated with sound; TEMPO which varies the rate at which the notes are played; SOUND which creates notes of

different pitch and duration for special effects; and NOISE which creates 'white noise' effects.

KEYBOARD

This is divided into three sections - the main alpha keys (in an off-white colour), the function keys and the editing keys (in a light grey/brown colour), all mounted on the lower level of a two tone case in cream and brown. All the keys have a positive feel about them.

A Tab key is an addition to the 800 and has forced the shift key on the left to be reduced in size to accommodate a displaced alpha key. This can cause problems with 'big fingers' where the alpha key gets it instead of the shift.

There are five easily definable function keys on the top row towards the left and the insert and delete keys towards the right. Below these two are the four cursor keys in N, S, E and W format.

DOCUMENTATION

This would have to be the best documentation yet provided on a Sharp pocket or home computer and we could argue that documentation is too detailed.

For example, it includes, within an in-depth hardware section, a number of small circuit diagrams which help to explain how, amongst other things, the Centronics port functions. Nevertheless, it is probably better to have too much information than not enough.

Basic is covered in adequate detail and a section of the system monitor is also included.

The manual also gives instructions on how to load the demonstration program (this follows Basic on the tape) and the ensuing demo made the most of the machine's features with fast, smooth screen scrolling within windows and fast line drawing with fill capabilities.

PERIPHERALS

Here's where the going really gets tough as there are so many options - it's a smorgasbord! We'll take each option one by one giving details on what it's for and the level of documentation available.

VIDEO RAM

An extra16K of video RAM is available and must be fitted by a dealer. The increase in video RAM enhances graphic display to 320 x 200 in 16 colours or 640 x 200 in 4 colours. Naturally, this type of output is usually too much for the poor old telly ,so a monitor is recommended if you seriously wish to use the extra video RAM. Documentation for the optional video RAM is provided in The Basic Manual and really needs no further explanation.

RAM DISC

Think of the fun you could have with this! An extra 64k of RAM which Basic treats as a disc drive. The RAM is recognized as drive 'E' by Basic and will operate in exactly the same way as a standard disc drive. The device is easily fitted by an experienced user but for those of you who suffer with sweaty fingers I would recommend dealer installation.

SEQUENTIAL DISC

Those of you familiar with the 'Quick Disc' available for the MZ-700 will be well aware of the capabilities of this little unit. In brief, this is Sharp's latest offering in the field of supplementary data storage devices. Each side of a 2.8" disc contains 64K of data that is recorded sequentially on a single concentric track.

The Sequential Disc loads programs and data, on average, about 60 times faster than a tape based system thereby loading MZ-700 Basic in approximately 3 seconds and MZ-800 Basic in about 5 seconds. For the technical amongst you - don't waste time asking about operating systems, number of sectors, etc., it's all immaterial. This device is meant for one thing only - fast and secure saving and loading of programs and data. Having had some 12 months experience using this drive I can whole-heartedly recommend its use by the home user or someone running a small business (Tupperware, Nutri-Metics, or the like) from home.

FLOPPY DISC

There are two floppy disc options available for the MZ-800 but both use the same casing. The options are, of course, single or dual drives. Each drive is double-sided, double density providing 320k of storage per drive. This is in line with the storage provided on the Sharp MZ-3500 desk top business computer and the MZ-800 can, in fact, read discs in MZ-3500 format as well as the standard IBM format. These facilities provide some exciting possibilities as will be seen later when we discuss software availability. There really isn't very much to say about floppy discs which is new or exciting as I would expect most people to know what they are and what they can do. Floppy buyers should note that buying a drive does not entitle them to Basic or CP/M or any other software, following Sharp's usual pricing policy on desk tops. These are all extras - you get exactly what you pay for.

SMOKO

For those so inclined I would suggest that you relax, light up and have a cup of coffee, we are now about half-way through and I wouldn't want you to lose concentration.

MONITORS

For those of you into 'high-res' Sharp are releasing two of their monitors for the MZ-800 (there are three

available in Japan). The first is a 14" RGB monitor capable of displaying 640 x 200 graphics in 16 colours. All I can say is don't have extra cash available when you go to buy your MZ-800 (and leave your credit card at home). If you see one you'll want one - enough said.

For business users who NEVER play games (you must be out there somewhere!) there is a 12" monochrome monitor with two magnificent shades of green, (OK, well you try to make it sound exciting). A third option designed to make you even less popular at home after spending the housekeeping on the basic computer is to use the family telly.

PRINTER

Again, MZ-700 owners will be familiar with this piece of equipment. For those who aren't the MZ-1P16 is a four colour plotter printer using roll paper about 4" in width. The mechanism allows printing in 3 sizes of 20, 40 or 80 characters per line. In graphics mode the MZ-1P16 is capable of some amazing tricks which, unfortunately, lack of space at this time precludes us from showing you. Suffice to say it is possible for a novice user to be producing Bar, Line or Pie charts in a very short time and, with more experience, be capable of producing some very detailed drawings. Great for biorhythms. Other than the MZ-1P16 any standard centronics printer should connect to the MZ-800 without difficulty.

RS232C

Unfortunately, I was unable to test this device at the time of writing but hopefully we will provide a separate review at a future date. I understand that the interface takes the form of a card and cable and that optional software will be available to drive printers and modems.

EXPANSION BOX

This device will be a necessary asset for those wishing to connect more than one peripheral to the MZ-800. The Expansion Box provides two card slots to enable connection of RS232's, floppy discs, sequential disc, etc. Why is it so big?

JOYSTICKS

Sharp have at last seen the light and have provided two industry-standard compatible joystick ports. MZ-700 owners will be pleased to note that joysticks available for the MZ-800 can self-centre without the aid of elastic bands. What more can one say about joysticks? - Look for an in depth review in a future issue (maybe).

OPERATION

TAPE - Those used to tape-based systems will be well aware of the problems and the MZ-800 is no exception. As stated earlier, loading MZ-700 Basic takes a little over 3 minutes and MZ-800 Basic about 4.30 minutes. MZ-700 Basic leaves about 36k free for the user whilst the MZ-800 version with its extra commands leaves about 22k free. It's a pity that Sharp provided a full MZ-800 version of the Basic on tape as this incorporates commands for the Sequential Disc as well as Floppy Disc and RS232 which are unlikely to be used by a person owning a tape based machine.

SEQUENTIAL DISC - As you may have gathered I am rather fond of this device and I think most end users will see why when they get their hands on one. The Sequential Disc operates in very much the same manner as tape with slightly different commands. Speed is the big difference and at the price suggested this will be a big seller.

FLOPPY DISC - A little more expensive than the Sequential Disc, the floppy will appeal to those wishing to use the MZ-800 for business. Ease of use does, of course, depend on the operating system being used and here Sharp provide a choice of FDOS (their proprietory operating system) or PCP/M. FDOS is a fairly basic OS allowing the user to create and use sequential or random access files. It is not the intention of this article to give a full review of PCP/M but suffice to say the system is extremely easy to use and the novice business user should have no trouble.

OVERALL

The keyboard is of better quality than the MZ-700 and the whole system is fairly easy to use provided one takes all the options one at a time and learns the full power of each before moving onto the next.

SOFTWARE

This software overview will be split into 5 sections giving a brief run down on each.

1. *Systems Software*
   As stated, users have the option of FDOS or CP/M with floppy disc as well as the standard tape and SD operating systems with those devices.
2. *Languages*
   Apart from the half-dozen or so languages available for the MZ-700, Sharp are releasing a Pascal and DR's Logo as options for the MZ-800. No doubt other languages will follow in the course of time and it is expected that the usual CP/M based languages will be available in the very near future.
3. *Business Software*
   Already configured for the MZ-800 under CP/M are: Wordstar, Multiplan, dBase II and various accounting packages. Many other packages will become available over the next few months and this is one of the great strengths of the MZ-800.

4. *MZ-700 Software*
   As discussed earlier most MZ-700 software will run without problems on the MZ-800, with over 400 packages available and more coming, this gets the MZ-800 off to a flying start.
5. *MZ-800 Software*
   Apart from some hybrid software which runs differently on the MZ-800 to the way it runs on the MZ-700 there is of course, a number of new titles which are specifically MZ-800. These include a new spreadsheet, word processing and some high-resolution arcade games. All of these will be available on tape or disc.
   All in all the MZ-800 starts its life with a huge software base which would be the envy of most other manufacturers.

PRICING

To give you an idea of the cost of the MZ-800 and peripherals, the following list contains approximate prices (subject to change of course). Unfortunately , we could not discover the prices of the RAM disc, Video RAM or Expansion Box.

MZ-800 with tape	$500
Sequential Disc	$300
Single Floppy	$500
Dual Floppy	$900
RS232c	$250
Plotter/Printer	$200
Joysticks	$ 25 (each)
Software from	$ 15

SUMMARY

With the wide range of options available I will be very surprised if the 800 doesn't take off. The machine is suited to a number of uses but in turn this will require the backing of a dealer network that knows what it's doing. Sharp again have an advantage in this respect, having built a reputable and knowledgeable dealer network over the last five years.

FOOTNOTE

It has been impossible to provide an in depth review of every aspect of the new machine, so in coming months we will be taking various parts of the system and looking at each in great detail.

Sound Generator for MZ-700

It often takes quite a while of experimenting to achieve the right sound to enhance your program. On the MZ-700, you are not necessarily restricted to the MUSIC command.

By POKEing to 2617 and 2618 to establish the frequency and USR(68)/USR(71) to switch on/off, the sound generator can be directly accessed.

The formula used is basically this:

Frequency (MHZ) = 2/(256B+A)

where A (the fine tuning) and B (the coarse tuning) are the decimal numbers in 2617 and 2618.

So, to add that finishing touch to your program, you can select from the following short sound routines, which mainly use the sound generator as described above, and incorporate into your program.

```
10  REM SPACE MUSIC 1
20  FOR A=1 TO 3:FOR B=10 TO 1 STEP -1:
    POKE 2618,B
30  FOR C=0 TO 200 STEP B:POKE 2617,C:
    USR(68)
40  NEXT C,B,A:USR(71)
```

```
10  REM SPACE MUSIC 2
20  FOR X=1 TO 4:FOR A=15 TO 5 STEP -1:
    POKE 2618,A/X
30  FOR T=20 TO 1 STEP -1:POKE 2617,T:
    USR(68):NEXT T,A,X
```

```
10  REM SPACE MUSIC 3
20  FOR X=1 TO 4:FOR A=15 TO 5 STEP -1:
    POKE 2618,A/5
30  FOR T=20 TO 1 STEP -1:POKE 2617,T:
    USR(68):NEXT T,A,X
```

```
10  REM SPACE MUSIC 4
20  FOR X=3 TO 6:FOR Z=6 TO 1 STEP -2:
    FOR T=60 TO 1 STEP -1
30  POKE 2618,T/Z:POKE 2617,T/X:USR(68)
    NEXT T:USR(71)
40  NEXT Z,X:MUSIC"+A3"
```

```
10  REM PHOTON
20  FOR T=1 TO 4:FOR A=1 TO 150:
    POKE 2618,A:USR(68)
30  NEXT A:USR(71): NEXT T
```

```
10  REM LASER
20  FOR T=1 TO 20:FOR A=10 TO 55:
    POKE 2618,A:USR(68)
30  NEXT A:USR(71): NEXT T
```

(continued on Page 24)

User Group Information

Each month we will provide as much space as is necessary to promote existing Sharp User groups and help establish new ones.

Our aim is to publish the Names, Suburbs and Telephone numbers of people who are, or would like to be, contact points for specific groups.

Readers, who may otherwise not be aware of a group in their locality, will get in touch with the contacts. Similarly, any enquiries we receive can be referred to the contact points.

In order to take advantage of this opportunity to advertise the existence of your group free of charge (or to start a new group), all interested parties are invited to submit the following details:

Name of Group, Association or Society
Address of regular meeting place (include Post Code)
Date of each regular meeting (eg. 1st Tuesday each month)
Time of regular meetings (eg. 8.00p.m. to 10.30p.m.)
Activities - including the range of equipment normally used
Special interest sub-groups (if any)
Name, Address and Telephone number of contact points

Naturally there are deadlines for each edition of SHARP FOCUS. Without making any promises, any details received by the 15th of each month will normally be included in the next months publication.

Please send your submissions directly to The Editor, SHARP FOCUS, Shop 2, 33 The Centreway, Mt. Waverley, Victoria 3149.

VICTORIA

Sharp Computer Users' Association

Venue: Burwood Heights Primary School, Mahoney's Rd., East Burwood.
Date: The second Friday of each month.
Time: From 7.30 p.m. onwards. Often with guest speakers followed by special interest groups for Graphics, Programming and Games.
Contact: Arthur Harris (03) 233 4661

Established User Groups

WESTERN AUSTRALIA

WA Pocket Computer Club and MZ User Group

Venue: Exhibition Hall, Rockeby Road, Subiaco.
Date: Every second Thursday of each month.
Time: 7.30 - 10.00. The club consists of pocket computer owners (80%) and MZ-700 owners (20%).
Contact: Stuart Bromley (09) 277 7477

SOUTH AUSTRALIA

The Adelaide Sharp Computer Club

Venue: 49 Oxford Terrace, Unley
Date: Every second Wednesday of each month.
Time: From 7.00 p.m. onwards. Mainly MZ-700 owners plus a few pockets.
Contact: Wayne Edge (08) 386 1179

NEW SOUTH WALES

Great Western Computer Users Group

Venue: Blacktown
Date: The first Tuesday of each month.
Time: 8.00 - 10.00. Many types of computers are used including the MZ-700.
Contact: Neil Curran (02) 674 1820

Pocket Computer Users' Club

Venue: Woodstock Community Centre, Church St., Burwood
Date: The first Wednesday of each month and the following Saturday (except for January).
Time: From 7.30 on Wednesdays or 2.00 on Saturdays. For anyone interested in pocket computers whatever the brand.
Contact: George Antonijevic (02) 683 4296

Space Bomber

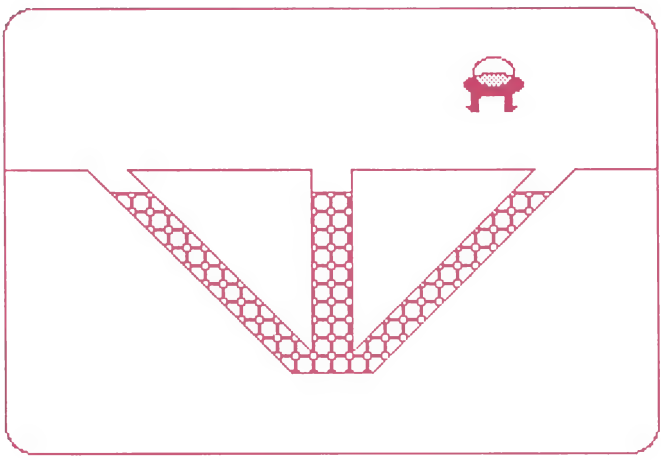
A Game for the MZ-700 by Philip Riley

Space Bomber is a simple but clever game for the MZ-700. In its present form it is a program for fast fingers. In the hands of an imaginative programmer it will form the basis of a colourful and entertaining program.

As the screen instructions will indicate, you are required to clear targets from valleys and caves by releasing bombs from your space craft. If you miss, you lose a life. There are five speeds from which to choose and ten screens to test your accuracy. But more importantly, it provides the groundwork for further development.

```
10 CLS:POKE2617,50:POKE2618,1
20 PRINT"■■■
```

```
510 IF(K=1)*(D=1)THENSS=SS+39
520 IF(K=1)*((PEEK(SS)=67)+(PEEK(SS)=77)
+(PEEK(SS)=78)+(PEEK(SS)=66)+(PEEK(SS)=8
6))THENK=2:IFBB=0THENLL=LL-1:CURSOR20,1:
PRINT"LIVES=";LL
530 IF(PEEK(SS)=71)THENSC=SC+1:BB=1:USR(
68):USR(71):CURSOR3,1:PRINT"SCORE=";SC
540 IFK=2THENBB=0:K=0
550 X=X+1:IFLL<1THENFORT=1TO2000:NEXT:GO
TO680
560 IFX=39THENPOKES,0:GOTO580
570 GOTO400
580 IFJJ=0THENLL=LL-1:CURSOR20,1:PRINT"L
IVES=";LL
590 FORQ=54207TO53649STEP-1:IF(PEEK(Q)=0
)*(PEEK(Q-40)=71)THENPOKEQ,71:POKEQ-40,0
600 IFJK=1THEN620
610 IF(PEEK(Q)=71)THENWE=1:JK=1
620 NEXT
630 IFWE=0THEN660
640 IFLL<1THEN680
650 BB=0:JJ=0:WE=0:JK=0:GOTO360
660 CLS:PRINT"■■■■■WELL DONE YOU HAVE CLE
ARED THE VALLEY.  YOU CAN NOW START AGAI
N ON ANOTHER.          PRESS ANY KEY":US
R($25B)
670 GOTO100
680 CLS:PRINT"■■■■■  BAD LUCK YOU HAVE R
UN OUT OF LIVES.     PERHAPS YOU WOULD L
IKE TO TRY AGAIN"
690 GETA$:IFA$="Y"THENRUN
700 IFA$="N"THENEND
710 GOTO690
720 LL=5
730 CURSOR3,1:PRINT"SCORE=";SC:CURSOR20,
1:PRINT"LIVES=";LL:RETURN
740 FORT=53648TO54247:IFPEEK(T)=0THENPOK
ET,71
750 NEXT:RETURN
760 FORT=53648TO53663:POKET,67:NEXT
770 E=53688:D=54208:A=1
780 FORT=ETODSTEP40:POKET,67:NEXT:A=A+1:
IFA=4THEN800
790 E=E+1:D=D+1:GOTO780
800 FORT=54211TO54247:POKET,67:NEXT
810 FORT=53687TO54207STEP40:POKET,67:NEX
T
820 POKE54187,78,67,67,67,67,67,67,67,67
,77:POKE54148,78,67,67,67,67,67,67,77:PO
KE54109,78,67,67,67,67,77:POKE54070,78,6
7,67,77:POKE54031,78,77
830 GOSUB720:GOSUB740:GOTO360
840 FORT=53648TO53660:POKET,67:NEXT
850 FORT=53675TO53687:POKET,67:NEXT
860 FORT=53688TO54208STEP40:POKET,67:NEX
T
870 FORT=53727TO54247STEP40:POKET,67:NEX
T
880 FORT=54209TO54246:POKET,67:NEXT
890 FORT=53661TO54129STEP39:POKET,86:NEX
T
900 FORT=53674TO54166STEP41:POKET,66:NEX
T
910 E=53689:D=54089:A=1
920 FORT=ETODSTEP40:POKET,67:NEXT:A=A+1:
IFA=12THEN940
930 E=E+1:D=D-39:GOTO920
940 E=53726:D=54128:A=1
950 FORT=ETODSTEP40:POKET,67:NEXT:A=A+1:
IFA=12THEN970
960 E=E-1:D=D-41:GOTO950
970 FORT=54181TO53947STEP-39:POKET,78:NE
XT
980 FORT=53948TO54195STEP41:POKET,77:NEX
T
990 E=54182:D=54193:A=1
1000 FORT=ETOD:POKET,67:NEXT:A=A+1:IFA=7
THEN1020
1010 E=E-39:D=D-41:GOTO1000
1020 GOSUB720:GOSUB740:GOTO360
1030 E=53648:D=53650:A=1
1040 FORT=ETOD:POKET,67:NEXT:A=A+1:IFA=1
5THEN1060
1050 E=E+40:D=D+42:GOTO1040
1060 FORT=54208TO54247:POKET,67:NEXT
1070 FORT=53687TO54207STEP40:POKET,67:NE
XT
```



```
1080 GOSUB720:GOSUB740:GOSUB360
1090 FORT=53648TO53652:POKET,67:NEXT:POK
ET,77
1100 FORT=53683TO53687:POKET,67:NEXT:POK
ET-6,78
1110 E=53688:D=53693:A=1
1120 FORT=ETOD:POKET,67:NEXT:POKET,77:A=
A+1:IFA=14THEN1140
1130 E=E+40:D=D+41:GOTO1120
1140 FORT=54208TO54247:POKET,67:NEXT
1150 E=53722:D=53727:A=1
1160 FORT=ETOD:POKET,67:NEXT:POKET-(D-E)
-2,78:A=A+1:IFA=14THEN1180
1170 E=E+39:D=D+40:GOTO1160
1180 FORT=53659TO53676:POKET,67:NEXT
1190 GOSUB720:GOSUB740:GOTO360
1200 E=53648:D=53653:A=1
```

```
1210 FORT=ETOD:POKET,67:NEXT:POKET,77:A=
A+1:IFA=15THEN1230
1220 E=E+40:D=D+41:GOTO1210
1230 FORT=54208TO54247:POKET,67:NEXT
1240 E=53687:D=53682:A=1
1250 FORT=ETODSTEP-1:POKET,67:NEXT:POKET
,78:A=A+1:IFA=15THEN1270
1260 E=E+40:D=D+39:GOTO1250
1270 POKET-1,67,67
1280 FORT=53656TO54066STEP41:POKET,66:NE
XT
1290 FORT=53679TO54069STEP39:POKET,86:NE
XT
1300 E=53666:D=54026:A=1
1310 FORT=ETODSTEP40:POKET,67:NEXT:A=A+1
:IFA=11THEN1330
1320 E=E-1:D=D-41:GOTO1310
1330 E=53669:D=54029:A=1
1340 FORT=ETODSTEP40:POKET,67:NEXT:A=A+1
:IFA=11THEN1360
1350 E=E+1:D=D-39:GOTO1340
1360 GOSUB720:GOSUB740:GOTO360
1370 E=53648:D=53648:A=1
1380 FORT=ETOD:POKET,67:NEXT:A=A+1:IFA=1
5THEN1400
1390 E=E+40:D=D+41:GOTO1380
1400 FORT=54208TO54247:POKET,67:NEXT
1410 E=53687:D=53687:A=1
1420 FORT=ETOD:POKET,67:NEXT:A=A+1:IFA=1
5THEN1440
1430 E=E+39:D=D+40:GOTO1420
1440 FORT=53667TO54147STEP120:POKET,67:N
EXT
1450 POKE54115,78:POKE54141,77:POKE54018
,77
1460 GOSUB720:GOSUB740:GOTO360
1470 E=53648:D=53650:A=1
1480 FORT=ETOD:POKET,67:NEXT:A=A+1:IFA=8
THEN1500
1490 E=E+40:D=D+42:GOTO1480
1500 E=53685:D=53687:A=1
1510 FORT=ETOD:POKET,67:NEXT:A=A+1:IFA=8
THEN1530
1520 E=E+38:D=D+40:GOTO1510
1530 FORT=54208TO54247:POKET,67:NEXT
1540 FORT=53953TO54199STEP41:POKET,66:NE
XT
1550 FORT=53942TO54176STEP39:POKET,86:NE
XT
1560 E=53928:D=54168:A=1
1570 FORT=ETODSTEP40:POKET,67:NEXT:A=A+1
:IFA=9THEN1590
1580 E=E+1:D=D+1:GOTO1570
1590 E=53896:D=54136:A=1
1600 FORT=ETODSTEP40:POKET,67:NEXT:A=A+1
:IFA=7THEN1620
1610 E=E+1:D=D-39:GOTO1600
1620 E=53967:D=54207:A=1
1630 FORT=ETODSTEP40:POKET,67:NEXT:A=A+1
:IFA=9THEN1650
1640 E=E-1:D=D-1:GOTO1630
1650 E=53959:D=54159:A=1
1660 FORT=ETODSTEP40:POKET,67:NEXT:A=A+1
:IFA=7THEN1680
1670 E=E-1:D=D-41:GOTO1660
1680 FORT=54181TO53986STEP-39:POKET,78:N
EXT
1690 FORT=54194TO53989STEP-41:POKET,77:N
EXT
1700 E=54182:D=54193:A=1
1710 FORT=ETOD:POKET,67:NEXT:A=A+1:IFA=7
THEN1730
1720 E=E-39:D=D-41:GOTO1710
1730 GOSUB720:GOSUB740:GOTO360
1740 FORT=53648TO54208STEP40:POKET,67:NE
XT
1750 FORT=53687TO54247STEP40:POKET,67:NE
XT
1760 FORT=54209TO54246:POKET,67:NEXT
1770 FORT=54174TO53667STEP-39:POKET,78:N
EXT
1780 FORT=53668TO54201STEP41:POKET,77:NE
XT
1790 E=54175:D=54200:A=1
1800 FORT=ETOD:POKET,67:NEXT:A=A+1:IFA=1
4THEN1820
1810 E=E-39:D=D-41:GOTO1800
1820 GOSUB720:GOSUB740:GOTO360
```

```
1830 FORT=53648TO54208STEP40:POKET,67:NE
XT
1840 FORT=54209TO54247:POKET,67:NEXT
1850 FORT=53687TO54207STEP40:POKET,67:NE
XT
1860 POKE53649,67,67:POKE53685,67,67:POK
E53659,67,67,67:POKE53674,67,67,67:POKE5
3853,67,67:POKE53881,67,67:POKE54060,67:
POKE54075,67:POKE54198,67:POKE54177,67:P
OKE54192,67,67,77
1870 POKE54152,67,77:POKE54112,77:POKE54
181,78,67,67:POKE54142,78,67:POKE54103,7
8
1880 GOSUB720:GOSUB740:GOTO360
```

Plotting with the PC-1500 and PC-2500

A step by step approach by David Saunders

We don't always want to be telling the computer the exact point to which we want it to move or to which to draw a line. We want it, from a suitable program, to work those things out for itself, namely the values of the X and Y co-ordinates. First let us look at those ways before we move onto triangles and circles.

As seen in the last article we can do it as a direct keyboard instruction. This is very arduous unless you are only doing a simple job once.

Another method is to put all the values in as DATA items, READ them and work on them. When we read them we must read them under the names of variables and then use those variables to do our drawing. So, if we read the values as X and Y we would then instruct the PC-1500 to draw a line to X, Y and it's program would be:-

```
10  :"V"RESTORE"V
20  GRAPH:
    GLCURSOR (0,-150):
    SORGN
30  :DATA 174,126,108,-78,
    41,126,216,0,0,0
40  :FOR A =1 TO 5: READ X,Y:
    LINE- (X,Y): NEXT A :TEXT:
    END
```

So our first line is drawn from where the pen was - (0,0) - to (174,126) and from there to (108,-78) to (41,126) to (216,0) and back to (0,0). Do it and observe the result.

Now, with the PC-2500 you'll recall that the Move or Draw commands have the co-ordinates expressed within a string, i.e. in inverted commas. The computer won't accept that a letter in inverted commas is anything other than a letter. It does not translate it into a numerical value. We must get it out of the inverted commas yet still have the required M's and D's and commas. This is how it's done. We leave those things that need to be in inverted commas, leave the variable letters without the inverted commas and join them all together with semi-colons. That has the same effect as putting them all into one long string. So our program for the PC-2500 becomes:

```
10  "V"RESTORE"V
20  LPRINT CHR$27+"b":
    LPRINT"M0,-150":
    LPRINT"I"
30  DATA 174,126,108,-78,
    41,126,216,0,0,0
40  FOR A = 0 TO 5: READ
    X,Y: LPRINT"D";X;",";Y:
    NEXT A:LPRINT
    CHR$27+"a": END
```

So we have drawn our pretty diagram using fixed data points. We can use calculated values.So, in line 40 on either machine, make it

```
:READ X,Y: X=2*X: Y=2*Y: etc.
```

and we've doubled the size of our drawing. We now try something else. Put in a line 15

```
15  :INPUT"FACTOR ";F
```

and alter those 2's to F's. Put in an F factor of any value within reason, say ,1 to 3, and watch the computer work. Do that before trying anything else. Now alter line 15 to read

```
15  INPUT"FACTOR";F,"X COORD
    ORIGIN";A,"Y COORD ORIGIN";
    B
```

and in line 20 for the PC-1500, make it

```
:GLCURSOR (A,B):
```

For the PC-2500 make line 20

```
:LPRINT"M";A;",";B:
```

So, as you must now have seen by experimenting, we can move our pen or draw to any point either from fixed data within a program from calculated results, or from data put in from the keyboard under program control. Take the X=F*X and Y=F*Y out of line 30 and alter the drawing instruction for the PC-1500 to

```
:LINE- (X*F,F*Y):
```

and for the PC-2500 to

```
:LPRINT"D"; F*X; ","; F*Y:
```

and observe your results again. If it is more convenient and memory-saving, do those

calculations at that point. Don't worry that in one place we have F*X and in another X*F - the result is the same.

We could have gone to a subroutine to calculate the X and the Y values. We could have called them by any legal variable name. We could have plotted the one we've called X along the Y axis and the one we've called Y along the X axis. We could have shifted the origin to any point on (or off) the paper within the machine's specified limits. We could have multiplied, divided, added to or subtracted from the variable to achieve the presentation sought. We could have magnified, or reduced, the values along one axis without altering the other.

Now, as another part of the learning curve, draw the following triangles. The points given are the co-ordinates of their corners. Do them either directly from the keyboard or as a program but don't shift the paper between drawing the first and the second triangle.

Run a bit of paper out before you start. The first triangle is to (0,52) to (26,52) to (0,0). You should not need all the instructions now. If you didn't know how to do it, re-read my first article and this one.

That triangle is a right-angled triangle because one of its angles is 90 degrees. The second triangle is (0,156) to (78,156) to (0,0). Now, if you've done all that correctly you will have two triangles superimposed on one another.

The vertical line of the larger triangle will be ruled over the vertical line of the smaller. The longest side of the larger triangle - the one opposite the right angle and called the "HYPOTENUSE" - has been ruled over the hypotenuse of the smaller. So those sets of values have drawn similar triangles. Here the word "similar" means that they have the same angles even though their sizes differ. So there must be some significance about those co-ordinates that makes them draw at similar angles.

In the smaller triangle, the Y value (52) is twice the X value (26). And, surprise, in the larger triangle the X and Y values bear the same relationship to each other as they do in the smaller triangle. In fact this ratio of the value of X - (which equals the length of the side OPPOSITE the angle) - divided by the value of Y - (which equals the length of the side ADJACENT to the angle) - is given its own name. That name is TANGENT and is abbreviated to TAN. The TAN of an angle in a right angled triangle is the ratio of OPPOSITE over ADJACENT, or TAN(ANGLE)= O/A = X/Y.

Mathematicians have calculated the values of tangents for every angle and these are published in tables. Your computer has inbuilt routines to do these calculations. If you doubt this, try the following examples - TAN27,TAN63. The figures you get are just the ratio of the X and Y values for the angle specified.

You can take my word, or prove to yourself by measurement, that OPPOSITE over HYPOTENUSE is also a fixed ratio for any angle and is called a SINE (abbreviated to SIN). Similarly ADJACENT over HYPOTENUSE is a COSINE (abbreviated to COS).

So, knowing the angle we can determine the value of X/Y by getting its TAN, the value of X/H by getting its SIN and the value of Y/H by its COS. Conversely, knowing the value of X/Y we can get the angle by its ATN. If we know the X value and the HYPOTONEUSE we can get the angle by ASN and we can get the angle by ACS if we know the Y value and the HYPOTENUSE.

Now remember our round clock face. The points represented by the numerals on the face are spaced at intervals of 30 degrees around the circumference of the circle. If we drew a line through the 12, the centre and the 6 we could call it the Y axis. A horizontal line through the 9, the centre and the 3 would become the X axis. The tip of the minute hand traces a circle as it does a revolution of the face. The radius of that circle is the length of the minute hand which we'll call R.

The co-ordinates of the number 12 are given by: (R*SIN 0,R*COS 0).

No.1 is at (R*SIN 30,R*COS 30),

No. 2 is at (R*SIN 60,R*COS 60)

and so on all the way round. If we draw lines joining those points we will draw a (rough) circle.

To try that, move our pen to the middle of the paper (108,0) on the PC-1500 and (240,0) on the PC-2500. Set the origin at that point as the centre fo the circle. We'll use a radius of 100 on the PC-1500 and 200 on the PC-2500. So let R equal that value in your machine. Now move the pen up to the point where the 12 is. If you don't know how, re-read these articles. Now draw a line from there to the co-ordinates for the number 1 and from there to No. 2's co-ordinates and so on.

As a program we'll go like this:-

```
40  Tell machine it is being
    used as a plotter.
50  Move to the middle of the
    paper.
60  Set the origin at that point.
70  Input "ANGLE STEPS ";
    A,"RADIUS";R
80  Move to (R*SIN 0, R*COS 0)
90  For C=0 TO 360 STEP A
100 Draw to (R*SIN C, R*COS C)
110 Next C
120 Move to (0,-R-15): set it
    back as a printer.
```

Try putting in various values for A (from 1 to 360 is OK) and for R. Observe the effects you get with the value of A small (1 to 10) and with A at 60,72,90,120.

Good plotting till next time. Have another look at your manuals. Try to read a simple book on trigonometry - which is what TAN , SIN and COS are all about.

Next month we'll look at pie-charts.

Review of the PC-1350

by Arthur Harris

The PC-1350 is a fairly recent release by Sharp and belongs to the family of 'pockets' which includes the PC-1250/1, PC-1260/1 and PC-2500 machines. This detailed review by Arthur Harris is being published in two parts.

It is located between the PC-2500 and the other machines, in that it contains more RAM at purchase (5k) than the two smaller machines, the RAM can be expanded, its printout capabilities are more limited than the PC-2500 and the resident ROM is smaller than the PC-2500 because it does not contain the bundled software of the PC-2500.

The equipment supplied to conduct this evaluation consisted of:-

(a) the PC-1350 pocket computer;
(b) a CE-202M 16kB RAM expansion card;
(c) a CE-126P printer/cassette interface; and
(d) a CE-130T RS-232C level adaptor.

VISUAL ASPECTS

When you open up the boxes, what are your first impressions?

The PC-1350

The machine is really pocket sized, measuring 182mm (wide) x 72mm (deep) x 16mm (high) but will place a strain on the seams of a shirt pocket, as it weighs a fairly hefty 190 grams(6.7 ounces).

On the top of the machine there is an LCD screen in the upper left portion and the rest of the face is occupied by keys. The screen will display 4 lines x 24 characters or 150 x 32 pixel, dot-addressable graphics. Down the left side of the screen are the annunciators for RUN/PRO mode, SHIFT, DEF and SML. There appears to be no annunciator for the angular mode that has been set as DEG., RAD. or GRAD.The keyboard consists of 62 keys plus the ON/OFF switch. Directly below the screen area is the ALPHA keyboard with the 26 letters in a QWERTY layout, =, SPC, ENTER, SHIFT, DEF and SML - a total of 32 keys. SHIFT, DEF and SML are in a line at the extreme left side. SPC is a key the same size as the letter keys, near the bottom right. The bottom right hand corner is occupied by the ENTER key which takes up the same space, lengthwise, as two letter keys together. The top row of letter keys carries the additional symbols !,",#,$,%,&,?,π,√ , and @, which are accessed by pressing SHIFT before the appropriate letter key.

Above the ENTER key is the legend P↔NP which allows the toggling of a hard copy of immediate mode calculations. This is accessed by use of the <SHIFT><ENTER> combination. 18 of the keys are enclosed by a box, signifying which keys may be used to define program segments that are accessed by pressing DEF, followed by one of these keys. The keys just described are grey, with the label in black, except for the shift key which is yellow with a black label. The legend above the keys is in a fine yellow script which tends to make it difficult to see in certain lights.

To the right of the screen and ALPHA keyboard is a group of 20 keys. These include the numeric keypad, augmented with the decimal point/full stop, brackets, maths operator symbols, together with the colon, semi-colon and comma. These keys are brown with a white label. Located above the brackets are the relational operator symbols < and >, while above the minus key is the exponentiation symbol (^).

These legends are in the same thin yellow line as in the ALPHA keyboard and, being so sparse, take a bit of locating against the silver/grey colour of the case.

The remaining 10 keys carry the cursor movement functions, DEL, INS, BRK, a second SHIFT key, MODE and CLS, and are located above the numeric keypad area. These keys are grey with black labels except for SHIFT (yellow with black label), MODE (green with white label) and CLS (red with white label). Above the CLS key is the legend CA, which performs a warm boot (all run mode pointers are cleared and there is no loss of program) and above the BRK key is the legend ON which switches the display back on after a timed-out display-only power down.

The ON/OFF switch is a slide type, located in the top right hand corner. This generally precludes an accidental switch off of the main

power. This would be an inconvenience only, as the machine retains whatever is in memory at powerdown anyway.

The right hand end of the machine carries the RS-232C port (the CE-130T plugs in here and it is normally covered) and a contrast control knob. The left hand end of the machine has the printer/cassette interface socket. This socket is normally not covered except by the hard cover provided to protect the screen and keyboard during transport. This cover can be placed on the back of the machine when the keyboard and screen are in use.

On the back of the machine are located the ALL RESET button (well) recessed to avoid accidental operation) and the cover for the RAM expansion card socket. The battery compartment is a separate section with its own cover within the RAM card compartment and can only be accessed by removing the RAM card, if one is installed. The machine requires 2 x 3v lithium cells.

The CE-126P

The unit is 140.5mm (wide) x 116mm (deep) x 23mm (high). The front of the unit carries the power switch (slide type) in the upper left corner. The upper right portion is occupied by the paper roll compartment and thermal printer. Below the printer is the paper feed button and the REMOTE ON/OFF switch. All of these controls are recessed, but easily accessible. The right hand side of the unit carries the connection cable which is about 400mm long. The left hand side of the unit has the cassette interface sockets and the external power adaptor socket. On the back of the unit is the cover to the battery compartment.

The unit requires 4 x AA size dry cells or it can be powered by an optional EA-23E adaptor. The cassette interface cable is also supplied with the unit. The total weight of the unit, including batteries, is 280 grams (9.9 ounces). A soft case is provided for transport protection.

The CE-202M

This unit measures 85.5mm (wide) x 54mm (deep) x 3.6mm (high) and weighs approximately 36 grams (1.3 ounces). It is powered by a 3v lithium cell (replaceable) and is provided with a soft case for transport protection.

The CE-130T

The case for this unit is 85.5mm (wide) x 120mm (deep, overall) x 50mm (high). The front of the unit carries the ON/OFF switch (slide type, recessed) and a low battery indicator LED. One end has the power adaptor socket and the RS-232C socket (25 pin, D type). The opposite end carries the cable for connection to the computer. This cable is about 700mm long. The unit is powered by internal rechargeable batteries or by an EA-11E power adaptor.

Cassette Recorder

The only other item required to make the system fully operational is a cassette recorder. The documentation recommends the CE-152 but also states the specifications to be met by any other recorder for it to be satisfactory.

CONSTRUCTION

All the unit cases are constructed from a brown, high-impact plastic, except for the face of the PC-1350 and the base and the end carrying the 25-pin socket on the CE-130T, which are metal. While the units are sturdy and obviously designed to cope with life in rough conditions, they should be treated with the respect they deserve as fine electronic instruments.

Whilst I did open up the cases to examine the internal construction, I did little more than simply observe that this is exceptionally neat, well laid out and exhibits a high standard of workmanship. There was no evidence of last minute adjustments to the circuit to correct bugs. I would not recommend that anyone unfamiliar with electronics open up the cases. There are no socketed chips to come loose. All you could do would be to admire the workmanship and then reassemble them.

OPERATION

The PC-1350

The computer has operation in 4 modes. These are :- as a calculator, as a computer, the reserve mode and as a communications device.

(i) Calculator Mode

To use this facility the machine must be in RUN mode. Calculations are entered in normal algebraic notation and the usual priority of operators applies, with brackets used to resolve any ambiguities. Calculations may include any BASIC functions and/or commands and may extend over more than one line (up to 79 characters). The answer is displayed on the following line. Several neat tricks are available, including one which allows simulation of a FOR....NEXT loop, step by step. Initiate this by setting a variable to a value (e.g. A=0). Enter several statements dependent on the value of that variable, with the statements separated by commas (e.g. A=A+5,SIN A,COS A,TAN A) and press ENTER. On the screen only the value of the last statement will be displayed. If the CE-126P is attached and the print option has been activated, by pressing <SHIFT><ENTER>, all the intermediate results will be printed. Press the right or left arrow keys to activate the edit mode and then press ENTER. The next set of values will be printed (or the next result of the last statement will be displayed). This may be continued for as long as you like, until an overflow or underflow error occurs. This feature is documented under chained calculations.

Another neat feature provided is

the ability to recall the last answer for use anywhere in your next calculation. Simply press the up or down arrow keys at the point where you want this figure used and there it is.

Results are displayed to 10 significant digits with a two digit exponent, if applicable, within the range 9.999999999E-99 to 9.999999999E 99. The machine calculates to 12 digit accuracy internally and apparently truncates to 10 digits for display.

String functions can be tested out in calculator mode and hex values can be included by prefixing the value with &. The possibilities are limited only by your imagination and the restrictions of the functions/commands available.

(ii) Computer Mode

In this mode it is possible to type in and run programs written in BASIC. The parameters are:-

- a maximum of 80 characters per line;
- multiple statements, separated by ':' are allowed;
- maximum line number allowed is 65279;
- 2-dimensional arrays allowed;
- each dimension must be in the range 0 to 255;
- line number 0 is not allowed;
- 26 fixed variables are provided (see below);
- hexadecimal constants may be used;
- two character variable names may be used;
- a full range of relational expressions is available;
- the logical operators AND, OR and NOT are provided; and
- verbs, commands and functions must be in upper case.

The major departure from the rule that statements within a single line must be separated by a ':' occurs in the case of assignment statements. In this case, a comma may be used as a separator.

For example :10 A=7, B=3, C-A*B is a legal statement that will not produce an error.

The fixed variables provided require some explanation, of which there are only 26. Any one of them may be assigned as EITHER a numeric or a string variable. Once assigned, an attempt to reference it as the opposite type, results in an error condition. They may be referred to as the arrays A( ) or A$( ). The assignments may be inter-mixed, eg. A, B, C assigned as numeric, D$, E$ as string. Then the statements A(6)=A(1)+A(2) and A$(7)=A$(4)+A$(5) will not cause an error. This is a powerful feature but it requires that you keep your wits about you. Obviously you use the fixed variables first since they occupy memory that is otherwise wasted. If a DIMA(n), or DIMA$(n) statement has been declared, the fixed variables may NOT be referenced as an array.

While discussing arrays, it seems an appropriate place to mention the limitations on string variables and their control within arrays. A normal string variable (two character name) will contain up to 12 characters. I could find, only with great difficulty, mention of the fact that a fixed string variable will only contain up to 7 characters maximum. A simple dimensioning of a string array will allow up to 12 characters in each element. However provision has been made to control the length of string array elements by the addition of a length parameter in the dimension statement. Thus DIM B$(5,3)*8 will limit the maximum length of each of the 24 elements to 8 characters. (NOTE that all dimensions of both numeric and string arrays begin at 8). The string length may be defined to be up to 80 characters maximum.

The fixed variable arrays may be extended beyond the 26 elements simply by an assignment, eg. A(35)=5 will ensure locations for A(27) to A(35) are reserved in the data space in RAM. The only restriction on this is that the highest numbered element must be assigned before any other variables are referenced. This can be handled before any program values are assigned by A(n)=0 at the beginning of the program (or A$(n)=**). Of course, when using the fixed variable array, A(0) and A$(0) are not available.

The argument for a function does not require use of brackets unless the argument is an expression.

The documentation divides the BASIC language into verbs, commands and functions although the distinctions are rather fine in some cases. This fact is acknowledged. At the start of Chapter 9 there is a list of commands, verbs and functions. At the foot of the page showing the commands, there is a note which states,

> *"These commands are also BASIC verbs. Their effect as commands is identical to their effect as verbs so they are not described in the command reference section. See the verb reference section for more information."*

The commands affected are marked by an asterisk and looking at them they are more commonly used as verbs. I feel that a better way to handle them would have been to list them as verbs and cross-reference both from the verb and command lists. It is only a small point and over-riding any criticism is my praise for the attempt to categorise in this way to assist in finding the required reference.

Editing of programs (or calculator mode statements) is achieved using the arrow keys. Firstly, in calculator mode, before pressing ENTER, the cursor may be moved throughout the statement(s) using the right or left arrow keys. To change a character, simply place the cursor over it and press the key for the character that you want (also called over-typing). The INS and DEL keys can also be used to insert or delete

a character at a time. In insert mode, you may insert the number of spaces your require and then type the characters. When you have finished your editing, it is not necessary to move the cursor to the end of the line before pressing ENTER. No characters are lost if the cursor is not at the end of the statement. Calculator mode statements may also be changed after pressing ENTER and examining the result. Just press either the right or left arrow keys, edit as required and press ENTER again, to see the new result.

In computer mode the up and down arrow keys are used to bring the line requiring editing to the top of the screen. Editing then proceeds as described above. The only difference is that the line number may also be edited. This results in a duplicate of the original line, with the new line number. The original line is still within the program. If a line exists with the number you have just assigned, it will be overwritten. It is thus possible to open up gaps in the line numbers to insert more lines, but care must be exercised in order not to overwrite lines that you don't want to lose.

In computer mode, the screen may be addressed as a graphics screen of 150 (horizontal) x 32 (vertical) pixels (picture elements). Two methods are available. The first is to light up (or switch off) a pixel at a specified (X,Y) co-ordinate location. The origin is the top left hand corner of the screen and valid values for X are 0 to 149 and for Y are 0 to 31. Both X and Y may take values in the range -32768 to +32767. If the values are outside the screen limits nothing happens and no error occurs. This method uses PSET and PRESET.

The second method involves the use of bit image graphics. A vertical line of 4 pixels can be assigned any one of 16 combinations of lit pixels. This method uses the GCURSOR and GPRINT statements. The GCURSOR explanation must be read carefully to find out that its location specifies the lowest of the 8 pixels defined by the GPRINT values. The GPRINT statement operates with pairs of hexadecimal digits, enclosed in quotes. These may be concatenated into strings. The first digit controls the lower 4 pixels and the second one the upper 4 pixels. In each nibble, the least significant bit controls the topmost pixel of the group. All this sounds a bit complicated but it is clearly explained in the manual and provides a powerful facility.

Also provided is a LINE function which allows lines to be drawn, erased or inverted between two co-ordinate locations. Other parameters specify the bit pattern for broken lines (dotted, dashed, centreline symbol, etc.), whether a box or a filled box is drawn. The screen graphics is altogether stunning. The only shame is that there is no way to get it out to a printer (yet). The POINT function returns a TRUE (+1) if the pixel referred to is lit and FALSE if that pixel is not lit. This is great for testing for the location of graphics in games.

On the sound front, the machine is very tame. The implementation of the BEEP command simply allows you to specify how many times a 4 MHz tone is repeated, in the range 1 to 9.999999999E 99. Negative numbers will produce neither a BEEP nor an error.

All the usual BASIC keywords are present in the lists. IF.....THEN does not support an ELSE clause. RESTORE does support use of (line), which may be a calculated value and defaults to the line whose number is equal to or next larger than the calculated value. ON.....GOSUB and ON.....GOTO both support calculated values for the target line numbers.

When using the RAM card expansions, the MEM command can be used, if desired, to ensure that only the RAM in the card is used for both program and variable storage. The card can then be removed and later re-installed with the programs and variables intact and ready for further use.

If the CE-126P and CE-152 are used for program and data storage, all the faithful old commands are there. The MERGE command allows several programs to reside in memory at the same time with the same line numbers. If the first line number of the merged program is larger than the last line number of the original program, the two programs are considered to be one program. Otherwise they are considered to be separate and only the last program loaded can be RUN or edited. The way to overcome the RUN problem is to give each program a label and access it using DEF (label). CHAIN works as expected, allowing segments of a program to be loaded and executed automatically from tape, using data as processed by the previous segment.

For program de-bugging, TRON and TROFF are there and work as expected. Once the program is working properly, it may be protected using PASS to set a password. Once set, this can only be removed by re-issuing the PASS command with the same password. Protected programs cannot be listed, edited, saved to tape or listed to the printer. How long before someone finds out how to crack this protection?

AREAD reads a single value from the screen into a program started by using the DEF key. CURSOR can use either X,Y co-ordinates with X in the range 0 to 23 and Y in the range 0 to 3 or a simple position P which ranges rom 0 to 95. For P, values 0 to 23 refer to the first line, 24 to 47 refer to the second line, etc.

The numeric functions cover all those expected, including ACS

(continued on Page 24)

Disc Care

Researched by Simon Anthony

If you bothered to work out how many hours it may have taken to create the original data on a particular disc, you will no doubt be surprised how long it took.

Yet, all those bleary-eyed, triumphant and frustrating hours can be lost all for the sake of proper disc handling.

So here is some information which most users probably think they know, but invariably forget.

Disc Storage

The recording surface on a disc is very sensitive and spins microns above the read head, so just about anything is large enough to interrupt the flow of data between the two. It is therefore sensible not to lay the disc on a dusty surface and never, NEVER touch the disc surface - this really will cause problems.

As jackets may easily become warped if discs are stored on top of each other, it is prudent to store them upright in a dustproof container.

Disc cleaning

In general, this cannot be easily done. Solvents such as alcohol, thinners and freon will remove the oxide from the disc.

There are companies who specialise in disc cleaning services, but it is quite expensive and can only be done as preventive maintenance and not as an answer to recovering lost data.

Handling Discs

You should never attempt to bend or fold a disc. Placing heavy objects on discs or jamming them together in a storage box will crush the jacket edges. This may well cause the discs to spin unevenly thus making reading erratic, if not impossible.

Labels

If you have to write on a label that has already been stuck to the disc, use a soft felt-tip pen. Don't use a ballpoint pen or pencil, and never use an eraser. The secret is to write the label before it is placed on the disc!

Peelable labels which do not leave a residue should be used if possible. Peel of the old label before applying a new one - you shouldn't apply labels in layers.

Jacket Care

You should never use clips, rubber bands or other types of fasteners on a disc envelope or jacket. If you really want to attach something to it, put the complete disc into a plastic or paper envelope. You can then clip anything to this additional covering.

Shelf Life

Discs should be stored within a temperature range of 10 to 50 degrees centigrade and a humidity range from 8 to 80 percent.

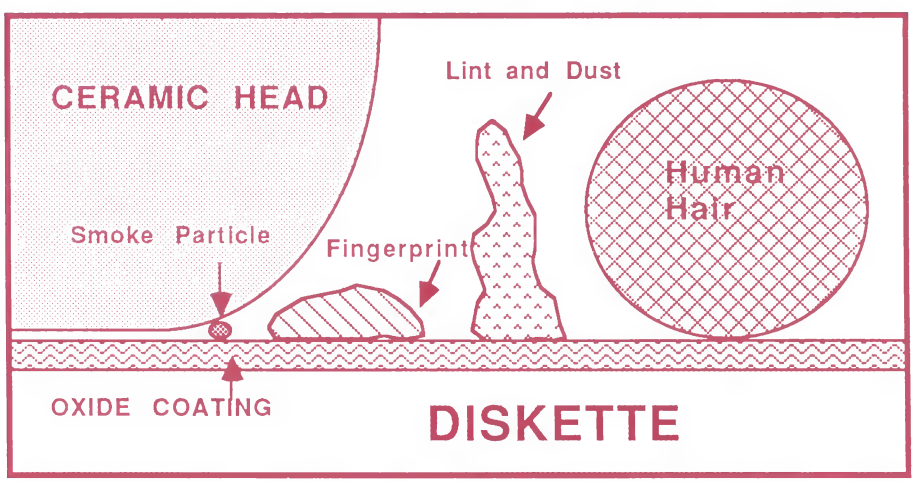
Some manufacturers claim that the shelf life of their discs, if kept within the conditions mentioned above, could be as much as thirty years!

Service life

A disc can normally be expected to provide from three to ten million passes. Naturally, a lot depends upon the disc drive being in good condition and handling by the user.

Operating Environment

The temperature and humidity ranges are the same as for the storage of discs. Thus excessive



heat or sunlight should most certainly be avoided.

Magnetic Fields

As the data on a disc is stored in minute magnetic regions, the information can be altered or completely erased if the disc is exposed to a magnetic field.

Permanent magnets such as those on typing guides or those used to hold notes on the sides of filing cabinets should be kept well away from discs.

Permanent magnets are also present in loudspeakers - so beware!

It is wise not to place the discs near any materials which may be carrying heavy current. Remember too, that any transformer or motor generates a magnetic field, but very small motors found in disc drives, printers or cassette recorders are not a problem. Just be careful of larger motors like air conditioners.

You should also keep your discs away from external power supply transformers, ballasts in fluorescent desk lights and transformers in the bases of high intensity lampshades.

Airport Metal Detectors

There are two types of detectors. The walk-through weapon detector generates a slight magnetic field (about 5 oersteds), but as it requires at least 50 oersteds to affect a disc, there should be no problem.

The other type of detector is used to examine carry-on baggage. However, as these are X-ray detectors they do not have any measurable magnetic effects.

Sending a disc in the Mail

It is most important to remember when packing discs, to ensure that they cannot be bent or crushed. It is a good idea to put two pieces of stiff cardboard (or even hard foam plastic) which have been cut to a size slightly larger than the disc jacket.

SOFTWARE FOR THE PC 5000 SERIES

GENERAL ACCOUNTING APPLICATIONS

Total Money Manager - Ilehead

Maintains a complete record of all business transactions and can produce a P&L statement "in a matter of minutes".

VERTICAL MARKET APPLICATIONS

QUOTA - Tabturn

Provides facilities for the travelling sales executive to prepare quotations at the client's site for jobs drawn from one of a number of "blue-prints".

SUPERPLANNER - Sharp Corp.

A personal desktop organizer maintaining an Address Book Card Box and Calendar.

STATPAK - Software Source

A complete set of Statistical Analysis Tools.

PERMIT - Technisearch (R.M.I.T.)

Provides 62,000 milestone dates, with calendar length and activities limited only by disc space.

DATABASE MANAGEMENT SYSTEMS

DBASE11 (Vers. 2.4) - Arcom, Software Source, JCM

An interactive, easy to use relational database management and application development system.

CONDOR 111 - Data Base Management Services

A database management and application development system ideal for end users.

KNOWLEDGEMAN - Data Base Management Services

A fully-integrated Management Information System which includes data management, ad-hoc enquiry, spread-sheet, statistical analysis and forms management.

WORD PROCESSING

SUPERWRITER - Sharp Corp.

Simple-to-learn word processor from Sorcim available in two forms: Executive (Bubble) and De-Luxe (Diskette).

EASYWRITER - Sharp Corp.

Comprehensive word processor from Information Unlimited via BSG. Integrates with EASYPLANNER and EASYCOMM.

VEDIT - Software Source

A full screen text editor designed for the programmer or technical user. Combines word processing, macro commands and customising of function keys.

FINANCIAL MODELLING/SPREAD-SHEET

SUPERCALC 2 - Sharp Corp.

An easy-to-use, super-powered spread-sheet processor, customised for the PC 5000 and available on bubble. Is an integral member of the Sorcim Super-tools suite.

(continued on Page 23)

Spreadsheet for the PC-1500

by Kevin Poynton

Whilst Simple-Calc is not designed to replace Visi-Calc, it may be used to perform repetitive calculations with normal arithmetic functions - plus, minus, multiply and divide, together with power, root and 'grow' commands.

The minimum configuration required is a Sharp PC-1500, a printer/cassette interface and 4K expansion RAM. When you have input the program and saved to tape, type DEF"Z".

The program begins by displaying the following menu:

SELECT OPTION>

1) New Calc
2) Amend Calc
3) Save Calc
4) Load Calc
5) Display Calc
6) Print Calc

Select the required option.

NEW CALC

The program asks for the following input:

a) no. of cols.	Enter no. of columns
b) no. of rows	Enter no. of rows
c) col. total req'd (Y/N)	Enter Y or N only
d) row total req'd (Y/N)	Enter Y or N only
e) enter formula col.#	Here the program uses an INKEY$ function for the first operand. On the first run through, this should be one of the following: +,-,*,/,P,R or G.

+ : will add the figure following the + sign to the base figure given in each row.

- : will subtract the figure following the - sign from the base figure given in each row.

***** : will multiply the figure following the * sign by the base figure given in each row.

/ : will divide the figure following the / sign into the base figure given in each row.

P : will give a result equal to the base figure in each row to the power of the figure following the P (eg. P2 as a formula would result in the base figure for each row being squared).

R : will give the square root of the base figure in each row.

G : this is a command and will lead you through a series of questions as follows:

i) *Enter Base Col.* - this may be any column (including 0) up to the column where this command is to be used.

ii) *Base Sing. or Mult. (S/M)* - enter only S or M. The program is asking if the the growth formula is to operate on a single figure, if the answer is yes then enter 'S.' If you require the value given as a base to be added to the total at the beginning of each period then enter 'M'. An example of the difference between 'S' and 'M' is as follows:

S - an amount of money is left in the bank for a period of time to accumulate interest - only the interest is added to the original amount.

M - a savings plan where a set amount of money is saved when each period is begun. Both increases in capital and interest are added to the original sum.

iii) *No. of Periods* - enter the number of periods for which growth is to take place. Be careful that this is correct. If the interest is to be added annually than the savings should also be entered on an annual basis.

iv) *% Growth Rate* - enter exactly what is required, ie. the percentage growth rate for each period. It is not necessary to divide by 100.

Note: if using the command to ascertain a future value where the annual interest rate is 10% but the interest is added monthly, the response 10/12 is valid. Savings and growth rates must always be input using the same basis.

f) enter base row 1	Enter value to which formula in each column is to apply, eg. a base of 10 in row 1 would result in R1C1 being equal to 12 where the

formula for column 1 was +2.

g) After the completion of the value for the last row, the screen will go blank for a period of time relative to the number of cells which have to be calculated. The menu shown previously will then return at which point you may select another option.

AMEND CALC

The program asks for the following input:

a) Change formula (Y/N) — Enter Y or N only. Assuming you choose Y the program will ask:

b) Which col. — Enter a valid col. no.

c) Enter formula col. # — As in Option 1 you will enter the formula required. However, the following additional commands are available in this mode:

A — Will ask 'Enter col. no.' After a valid column no. has been entered, the program will continue to ask for more col. nos. until a 'Q' is entered.

[The purpose of the 'A' command is to add to the existing value of the column nominated in b) above the values of the column numbers entered after the 'A' command has been selected].

S — Simply hit Enter after this command has been entered. The result will be that the col. nominated in b) above will now contain the sum of all the previous columns including the base value.

[This command differs from the 'A' command in that the value caculated replaces any previous value in the column nominated and is not added to it].

d) Amend base (Y/N) — Enter Y or N only. Assuming you choose Y the program will ask:

e) Which row — Enter a valid row number.

f) Enter base row # — As in 1f (New Calc) enter the value required.

[An alternative command in the amend mode is to enter an 'A' followed by enter. The response will be: Enter formula. You may then respond only as follows: Assuming you are working on row 5, you could enter R1+R2-R4. The result would then be stored as the base value for row 5. Only + and - work in this fashion, entering any other character will cause the program to crash].

g) After you have finished amending your original values, the program will return you to the main menu.

SAVE CALC

a) Tape Ready (Y/N) — Enter only Y or N. Ensure that you have your tape ready and the recorder is in the 'record' mode. Be careful not to erase your program or other required data.

b) Assuming your answer was Y, the computer will begin to record both data and formulae to tape.

c) You will now return to the main menu and may select any option.

LOAD CALC

a) Tape ready (Y/N) — Enter only Y or N. Ensure you have your tape ready and the recorder in play mode.

b) Assuming your response was Y, the computer will immediately begin to load both data and formulae from tape.

c) You will now return to the main menu and may select any option.

DISPLAY CALC

a) The display will show the value of the cell at the intersection of the highest row/column (excluding row and column totals).

b) You may move through the spreadsheet by using the cursor control keys in the normal fashion.

c) To return to the menu, enter 'Q'.

PRINT CALC

a) The computer will print the integer value only of all the cells. If the option has been taken up to have row and column totals, these will be printed in a different colour.

b) On completion of the printing, you will be returned to the main menu.

CONCLUSION

This program is not foolproof. To include the many error checking routines required to make it so would use up too much memory. I have taken the attitude that anyone who would require to use a spreadsheet would be capable of following the options outlined above.

```
 10 "Z"
 50 RESTORE
 51 GOTO 100
 60 CLEAR :INPUT "TAPE READY (Y/N) ";Q$
 70 IF Q$<>"Y"THEN 110
 80 INPUT #"CALC SIZE";CO,RO
 85 DIM CF(CO+1),CE(RO+1,CO+1),Q$(CO+1),X(CO)
 90 INPUT #"CALC DATA";CF(*),CE(*),Q$(*),X(*),RT$,CT$
100 CURSOR 4:PAUSE "***SIMPLE CALC.***"
110 CLS :PAUSE "SELECT OPTION>"
120 PAUSE "1) NEW CALC"
130 PAUSE "2) AMEND CALC"
140 PAUSE "3) SAVE CALC"
150 PAUSE "4) LOAD CALC"
160 PAUSE "5) DIPLAY CALC"
170 PAUSE "6) PRINT CALC"
180 INPUT "SELECT OPTION>",A
190 ON AGOTO 500,2600,2500,60,3000,2000
195 GOTO 110
200 END
500 "NEWCALC":IF A=4THEN 570
505 CLEAR
510 INPUT "NO. OF COLS",CO
520 INPUT "NO. OF ROWS",RO
530 INPUT "COL.TOTAL REQ/D(Y/N)";CT$
540 INPUT "ROW.TOTAL REQ/D(Y/N)";RT$
560 DIM CF(CO+1),CE(RO+1,CO+1),Q$(CO+1),X(CO)
570 A=0
590 WAIT 0
600 CLS :FOR I=1TO CO
605 WAIT 0:Q$(I)=""
610 CURSOR 0:PRINT "ENTER FORMULA COL.";I
620 CURSOR 21:Q$(I)=INKEY$
625 IF Q$(I)=""THEN 620
627 IF Q$(I)="A"THEN GOSUB "A":GOTO 640
630 IF Q$(I)="G"THEN GOSUB "G":GOTO 640
632 IF Q$(I)="S"THEN 640
635 CURSOR 21:PRINT Q$(I):CURSOR 22:
    INPUT CF(I)
640 CLS :NEXT I
650 "BASE-ENT"
660 FOR I=1TO RO
670 CURSOR 0:PRINT "ENTER BASE ROW ";I
680 CURSOR 19:INPUT S$
681 IF S$="A"THEN GOSUB "ERR":GOTO 690
682 CE(I,0)=VAL S$
690 CLS :NEXT I
1000 "CHECKFORM"
1010 FOR C=1TO CO
1020 IF Q$(C)="*"THEN GOSUB "*"
1030 IF Q$(C)="/"THEN GOSUB "/"
1040 IF Q$(C)="+"THEN GOSUB "+"
1050 IF Q$(C)="-"THEN GOSUB "-"
1060 IF Q$(C)="P"THEN GOSUB "^"
1070 IF Q$(C)="R"THEN GOSUB "SQR "
1075 IF Q$(C)="G"THEN GOSUB "G1"
1080 IF Q$(C)="A"THEN GOSUB "A1"
1082 IF Q$(C)="S"THEN GOSUB "S"
1085 NEXT C
1090 IF CT$="Y"THEN GOSUB "CTOTAL"
1095 IF RT$="Y"THEN GOSUB "RTOTAL"
1097 GOTO 110
1200 "PERCALC"
1210 "*":FOR I=1TO RO
1220 CE(I,C)=CE(I,0)*CF(C)
1230 NEXT I:RETURN
1260 "/":FOR I=1TO RO
1270 CE(I,C)=CE(I,0)/CF(C)
1280 NEXT I:RETURN
1310 "+":FOR I=1TO RO
1320 CE(I,C)=CE(I,0)+CF(C)
1330 NEXT I:RETURN
1360 "-":FOR I=1TO RO
1370 CE(I,C)=CE(I,0)-CF(C)
1380 NEXT I:RETURN
1410 "^":FOR I=1TO RO
1420 CE(I,C)=CE(I,0)^CF(C)
1430 NEXT I:RETURN
1460 "SQR ":FOR I=1TO RO
1470 CE(I,C)=SQR CE(I,0)
1480 NEXT I:RETURN
1500 "A":CLS
1505 FOR Z=0TO CO
1510 INPUT "ENTER COL. NO. ";X$
1520 X(Z)=VAL X$:IF X$="Q"THEN 1540
1530 NEXT Z
1540 RETURN
1550 "A1"
1560 FOR I=0TO Z-1
1570 FOR R=1TO RO
1580 CE(R,C)=CE(R,C)+CE(R,X(I))
1585 NEXT R
1590 NEXT I:RETURN
```

```
1600 "G":CLS :INPUT "ENTER BASE COLUMN",WC
1610 INPUT "BASE SING.OR MULT.(S/M)";B$
1620 INPUT "NO. OF PERIODS",N
1630 INPUT " % GROWTH RATE",P
1640 P=P/100:RETURN
1650 "G1"IF B$="M"THEN 1700
1660 FOR I=1TO RO
1670 GV=CE(I,WC)*((1+P)^N)
1680 CE(I,C)=GV:NEXT I:GOTO 1740
1700 FOR I=1TO RO
1710 GV=CE(I,WC)*((((1+P)^(N+1))-(1+P))/P)
1720 CE(I,C)=GV:NEXT I
1740 RETURN
1750 "S"
1755 FOR R=1TO RO
1757 CE(R,C)=0
1760 FOR I=0TO C-1
1765 CE(R,C)=CE(R,C)+CE(R,I)
1770 NEXT I
1780 NEXT R
1790 RETURN
1800 "CTOTAL":C=0:R=1
1810 FOR C=0TO CO
1815 CT=0
1820 FOR R=1TO RO
1830 CT=CT+CE(R,C)
1840 NEXT R
1850 CE(R,C)=CT
1860 NEXT C
1890 RETURN
1900 "RTOTAL"
1905 IF RT$="Y"LET RO=RO+1
1910 FOR R=1TO RO
1915 RT=0
1920 FOR C=0TO CO
1930 RT=RT+CE(R,C)
1940 NEXT C
1950 CE(R,C)=RT
1960 NEXT R
1965 IF RT$="Y"LET RO=RO-1
1990 RETURN
2000 "PRINT1"
2010 GRAPH :ROTATE 1:CSIZE 1:COLOR 1
2020 GLCURSOR (210,0):SORGN
2025 R=RO:C=CO
2030 IF RT$="Y"THEN LET C=CO+1
2040 IF CT$="Y"THEN LET R=RO+1
2050 FOR I=0TO C
2060 IF I>COTHEN COLOR 3
2070 GLCURSOR (0,-I*50-180)
2080 FOR J=1TO R
2085 IF I>COTHEN COLOR 3:GOTO 2100
2090 IF J>ROTHEN COLOR 3:GOTO 2100
2095 COLOR 1
2100 GLCURSOR (-J*10-10,-I*50-180)
2110 LPRINT INT (CE(J,I)):Z=1
2120 NEXT J
2130 NEXT I:GOTO 110
2500 "SAVE CALC"
2510 INPUT "TAPE READY ?(Y/N) ";Q$
2520 IF Q$<>"Y"THEN 110
2530 PRINT #"CALC SIZE";CO,RO
2540 PRINT #"CALC DATA";CF(*),CE(*),Q$(*)
     ,X(*),RT$,CT$
2545 GOTO 110
2600 "AMEND":Q$(C)=""
2610 INPUT "CHANGE FORMULA (Y/N) ";Q$
2615 Q$(C)=""
2620 IF Q$<>"Y"THEN 2700
2630 INPUT "WHICH COLUMN ?";C
2635 Q$(C)=""
2640 CURSOR 0:PRINT "ENTER FORMULA COL.";C
2650 CURSOR 21:Q$(C)=INKEY$
2655 IF Q$(C)=""THEN 2650
2657 IF Q$(C)="A"THEN GOSUB "A":GOTO 2690
2660 IF Q$(C)="G"THEN GOSUB "G":GOTO 2690
2665 CURSOR 21:PRINT Q$(C):CURSOR 22:INPUT
     CF(C)
2690 CLS :INPUT "ANY MORE (Y/N) ";Q$
2695 IF Q$="Y"THEN 2630
2700 INPUT "AMEND BASE (Y/N)";Q$
2710 IF Q$<>"Y"THEN GOSUB 1000:GOTO 110
2720 INPUT "ROW NO. ",I
2730 CURSOR 0:PRINT "ENTER BASE ROW ";I
2740 CURSOR 19:INPUT S$
2741 IF S$="A"THEN GOSUB "ERR":GOTO 2790
2742 CE(I,0)=VAL S$
2790 CLS :INPUT "ANY MORE (Y/N) ";Q$
2795 IF Q$="Y"THEN 2700
2799 GOSUB 1000:GOTO 110
3000 "D"
3001 R=RO:C=CO
3003 ON ERROR GOTO 3000
3005 WAIT 0
3010 CLS :CURSOR 15:PRINT "R ";R;":C";C
3015 CURSOR 0:PRINT CE(R,C)
3020 CURSOR 5:Z$=INKEY$
3025 IF Z$=""THEN GOTO 3020
3030 IF Z$="Q"GOTO 110
3040 IF Z$=(CHR$ 11)THEN LET R=R-1:GOTO 3010
3050 IF Z$=(CHR$ 10)THEN LET R=R+1:GOTO 3010
3060 IF Z$=(CHR$ 12)THEN LET C=C+1:GOTO 3010
3070 IF Z$=(CHR$ 8)THEN LET C=C-1:GOTO 3010
3080 IF R>ROOR R<1THEN 3020
3090 IF C>COOR C<0THEN 3020
3095 GOTO 3010
3500 "ERR":CLS
3510 INPUT "ENTER FORMULA";X$
3520 FOR K=1TO LEN X$
3530 IF MID$ (X$,K,1)="R"THEN LET RA=VAL
     MID$ (X$,K+1,2):IF K=1THEN 550
3532 RA=VAL MID$ (X$,K+2,2)
3535 IF MID$ (X$,K,1)="+"THEN 3550
3540 IF MID$ (X$,K,1)="-"THEN 3560
3545 GOTO 3570
3550 CE(I,0)=CE(I,0)+CE(RA,0):GOTO 3570
3560 CE(I,0)=CE(I,0)-CE(RA,0)
3570 NEXT K
3580 RETURN
```

A special thanks to
Peter Kent
without whose help
this program listing would
not have been produced

(continued from Page 18)

EASYPLANNER - Sharp Corp.
A spread-sheet with superior functions from Information Unlimited via BSG. Integrates with EASYWRITER and EASYCOMM.
DATAGENIE - Cowirrie Computing
A simple data base system designed especially for the ranking, calculating and selecting of numeric data.

GENERAL SYSTEM-BUILDING UTILITIES
T/MAKER 111 - The Computer Factory
A powerful, flexible collection of system-building tools encompassing word processing, file management, spread-sheet functions and bar graphics - all totally integrated.
DBASE 11, CONDOR 111 and KNOWLEDGEMAN should also be considered in this category.

LANGUAGES
GW-BASIC - Sharp Corp.
This interpreter is the graphics extension to MBASIC, compatible with all other GWBASIC. The only restriction relates to the 8 line LCD.
MICROSOFT BASIC - Calcomprint, Arcom, Software Source.
The accepted standard microprocessor based BASIC interpreter.
BASIC-COMPILER - Calcomprint, Arcom, Software Source.
Microsoft Basic compatible compiler - makes BASIC programs run many times faster.
MICROSOFT BUSINESS BASIC COMPILER - Arcom, Calcomprint, Software Source.
Specifically designed for the development of business applications in BASIC. Produces native code rather than psuedo-code.
'C' COMPILER - Calcomprint, Arcom, Software Source.
The Microsoft implementation of 'C' for 8086/8088 based microcomputer systems using MS-DOS.
'C-86' COMPILER - Software Source
Digital Research implementation of 'C' for 16-bit micros.
COBOL COMPILER - Calcomprint, Arcom, Software Source.
Microsoft's implementation of ANSI-74 COBOL, level 1. Includes optional sort facility.
PASCAL COMPILER - K.J. Computer Services
The COMPAS-86 Pascal compiler will compile at up to 5000 lines per minute in a single 32k byte program. Offers a WORDSTAR compatible editor.
PASCAL COMPILER - Calcomprint, Arcom, Software Source.
Microsoft's Pascal Compiler conforming to the ISO proposed standard (level 0).
PASCAL MT Plus - Software Source
A tried and proved CP/M package (on diskette only).
PL/1 - Arcom
An implementation of PL/1 for microcomputers utilising the Intel 8088 processor chip. Not recommended for the PC 5000 unless used for special application such as system development for larger machines.
FORTRAN COMPILER - Calcomprint, Arcom, Software Source.
A 16-bit native-code FORTRAN-77 compiler requiring 140kb user RAM.

SYSTEMS UTILITIES
Systems Development/File Management
ACCESS MANAGER - Software Source
The File Access Utility may be used with all other Digital Research software such as Display Manager and 'C' to provide a sophisticated set of management tools.
DISPLAY MANAGER - Software Source
Achieves portability of screen displays and provides complete control of input and output fields.
DIGITAL RESEARCH PROGRAMMING UTILITIES - Software Source.
A complete set of programming, editing and debugging tools.
MACRO ASSEMBLER - Calcomprint, Arcom, Software Source.
Sophisticated package including linking/loading, cross reference facility and library manager.
SORT FACILITY - Calcomprint, Arcom, Software Source.
Microsoft compatible sorting utility giving either a stand alone sort program or a COBOL-hosted sorting facility.

SYSTEM UTILITIES
Text/Documentation Management
BIBLIOGRAPHY - Software Source
Database Manager designed for the management of textual information. Suited to the Legal and Medical professions.
PUNCTUATION AND STYLE - Software Source
Will correct punctuation, abbreviation, double-words, numbers, and spaces between punctuation.
THE WORD PLUS - Software Source
A spelling checker with a 40,000 word dictionary and hononym help, word count, anagram and rhyming words.

SYSTEM UTILITIES
Communications
SUPERCOMM - Sharp Corp.
An advanced Asynchronous Communication package allowing the PC 5000 to act as a terminal to a mainframe or a mini-computer, or to another PC 5000.
EASYCOMM - Sharp Corp.
Communication package providing access to other PC 5000's or larger computer systems. Sends and receives files at up to 19200 bps.

(continued from Page 6)

```
10  REM MACHINE GUN
20  FOR B=1 TO4:FOR T=1 TO 6:
    FOR A=10 TO 25:POKE 2618,A:USR(68)
30  NEXT A:USR(71):NEXT T:FOR D=1 TO
    300:NEXT D,B

10  REM MOTORCYCLE
20  FOR T=1 TO 4:FOR A=150 TO 100
    STEP -1:POKE 2618,A
30  FOR B=0 TO 255 STEP A/T:POKE
    2617,B:USR(68)
40  NEXT B,A:USR(71):NEXT T

10  REM TELEPHONE
20  FOR T=1 TO 3:FOR A = 1 TO 2:
    POKE 2618,7:FOR B=1 TO 5
30  POKE 2617,150:USR(68):FOR C=1 TO 6:
    NEXT C
40  POKE 2617,255:USR(68):FOR D=1 TO 6:
    NEXT D,B
50  MUSIC"R3":NEXT A:MUSIC"R6":NEXT T

10  REM SIREN 1
20  B=10:FOR C=1 TO 5:FOR A=250 TO 1
    STEP -2
30  POKE 2617,A: POKE 2618,B: USR(68):
    NEXT A
40  FOR A=1 TO 250:POKE 2617,A:
    POKE 2618,B:USR(68):NEXT A,C

10  REM SIREN 2
20  FOR A=1 TO 5:POKE 2618,8:
    FOR B=255 TO 5 STEP -3
30  POKE 2617,B:USR(68):NEXT B
40  FOR C=5 TO 255 STEP 3:POKE 2617,C:
    USR(68):NEXT C,A

10  REM SIREN 3
20  FOR A=1 TO 5:POKE 2618,3:
    FOR B=255 TO 1 STEP -7
30  POKE 2617,B:USR(68):NEXT B,A

10  REM SIREN 4
20  TEMPO 4:FOR X=1 TO 10:
    MUSIC"G4E4";NEXT

10  REM SIREN 5
20  FOR A=1 TO 5:POKE 2618,7:
    FOR B=1 TO 10:POKE 2617,50:USR(68)
30  FOR C=1 TO 60:NEXT C:POKE 2617,205:
    USR(68):FOR D=1 TO 10:NEXT D,B,A
```

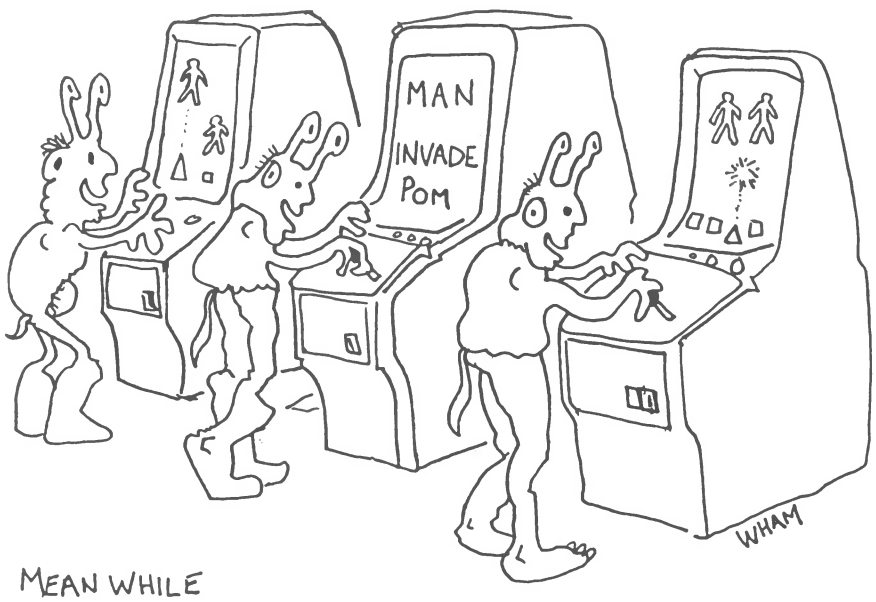
(continued from Page 16)

(arccosine) and ASN (arcsine). The string functions also have all of those expected. VAL will extract a numeric value from a string up to the first non-numeric character encountered.

One very useful feature provided is the PRINT=LPRINT command. When this command is issued, all PRINT statements in the program will direct output to the CE-126P without further alteration. To revert to screen output, issue the command PRINT=PRINT.

NEXT MONTH

Arthur will continue his review, and cover the Operational areas of Reserve Mode, Communications Mode, Peripherals and Documentation. He will also provide some benchmarks and his final conclusions.



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ON A FAR AWAY PLANET

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